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FM 3-21

FIELD MANUAL

**CHEMICAL-BIOLOGICAL
ACCIDENT
CONTAMINATION
CONTROL**

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CHEMICAL-BIOLOGICAL ACCIDENT CONTAMINATION CONTROL

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SECTION I

INTRODUCTION

1. Purpose

This manual provides guidance for training, equipping, and utilizing emergency teams for contamination control during accidents/incidents involving chemical agents and biological material. Specific guidance is provided for chemical, biological, radiological (CBR) teams and decontamination teams.

2. Scope

a. This manual covers procedures and techniques for reducing chemical and biological hazards resulting from accidents. It describes procedures and practices for detecting, identifying, controlling, and decontaminating chemical contamination and the sampling and decontaminating of biological contamination.

b. This manual is designed primarily for peacetime operations but is applicable in wartime operations.

c. This manual is in consonance with the international standardization agreements (STANAG) listed below. These STANAG are identified by type of agreement and number at the beginning of each appropriate section or appendix in this man-

ual. The following terms are used to describe the types of agreements: NATO STANAG—STANAG applicable to nations of the North Atlantic Treaty Organization; CENTO STANAG—STANAG applicable to nations of the Central Treaty Organization; SEATO SEASTAG—Southeast Asia STANAG applicable to nations of the Southeast Asia Treaty Organization; ABCA SOLOG—Standardization of Certain Aspects of Operations and Logistics among the American, British, Canadian, and Australian Armies.

3. Comments and Changes

Users of this manual are encouraged to submit recommended changes and comments to improve the publication. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons will be provided for each comment to insure understanding and complete evaluation. Comments should be prepared using DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commandant, US Army Chemical Center and School, ATTN: ATSCM-A, Fort McClellan, Alabama 36201.

TITLE	NATO STANAG	CENTO STANAG	SEATO SEASTAG	ABCA SOLOG
Marking of Contaminated or Dangerous Land Areas.....	2002	2002	2002	-----
Explosive Ordnance Disposal Training.....	2137	-----	2137	-----
Definitions and Regulations for Military Motor Movements by ROAD.....	2154 (2d ed)	2154	2154	-----
Requisite Elements of Explosive Ordnance Disposal Activities and Capabilities.....	2312	-----	2312	-----
Explosive Ordnance Disposal Equipment and Procedures.....	2313	-----	-----	-----
Organization and Doctrine for Explosive Ordnance Disposal Oper- ations.....	2314	-----	2314	-----
Restraint of Cargo in Fixed Wing Aircraft.....	3400	-----	3400	-----
Classification, Certification and Labeling of Dangerous Cargo.....	3571	-----	-----	-----
Military Abbreviations.....	-----	-----	-----	20

SECTION II

RESPONSIBILITIES

4. General

a. The service or agency having custody of chemical and biological (CB) material is responsible for all actions at the scene of an accident involving the material. The major army commander of the area in which an accident occurs is responsible for taking necessary measures to protect persons and property under Army jurisdiction, except at installations commanded by other major commanders. When requested, other commanders will render assistance within their capabilities.

b. Major commanders responsible for CB accident control will be prepared to dispatch a general officer, in accordance with AR 50-21, to act as on-scene commander.

c. Units that are involved or may become involved with hazardous CB material should prepare a chemical-biological accident/incident control plan (CBAICP).

5. Commanding General, United States Continental Army Command (CGCONARC)

The Commanding General, CONARC is responsible for all Army chemical-biological accident/incident control (CBAIC) activities throughout

CONUS except at installations commanded by other major commanders.

6. Commanding General, United States Army Materiel Command (CGAMC)

The Commanding General, AMC is responsible for CBAIC on installations under his command and will assume complete CBAIC responsibility when the effects of an accident/incident on a USAMC installation in CONUS extend beyond the boundaries of that installation.

7. Edgewood Arsenal, Maryland

a. *Medical Laboratories.* The Medical Laboratories of Edgewood Arsenal have the responsibility for processing biological material samples (para 35).

b. *Technical Advisors.* Edgewood Arsenal has the responsibility to provide technical experts to advise on any peculiar CB problems. It is anticipated that such experts will be called upon to determine if decontamination is complete.

c. *Medical Advisors.* Edgewood Arsenal has the responsibility to provide medical experts who are knowledgeable in medical treatment of CB casualties.

SECTION III

CB ACCIDENT/INCIDENT HAZARDS

8. Explanation of Terms

a. A chemical or biological accident is any situation involving chemical or biological material that results in:

(1) Physical damage to chemical munitions or CB containers which causes spillage.

(2) Exposure of unprotected personnel to hazardous quantities of CB material.

(3) Contamination of public or private land, buildings, equipment, animals, or vehicles.

(4) Fire, explosion, or natural disaster involving CB material which causes release of or results in contamination by the material.

(5) Loss, seizure, or theft of chemical or biological material.

b. A significant chemical or biological incident is any situation which, if not corrected, could result in an accident. (Examples are cited in AR 50-21 and AR 385-40.)

9. Hazards

a. Explosives. Some chemical munitions may contain explosives when shipped. These explosives constitute an additional hazard when involved in an accident. Whenever detonation or fire occurs during shipment or storage of chemical weapons, explosive ordnance disposal (EOD) personnel will be notified. Fires should be fought in accordance with the provisions of TM 5-315 and TM 9-1300-206.

b. Chemical Material. Chemical material may present hazards through inhalation, ingestion, absorption, or a combination of these methods. Technical escort personnel accompanying shipments should be consulted, as well as the shipper, for the specific hazards associated with military chemical agents. TM 3-215 contains detailed information on military chemical agents. The publications listed in paragraph 2 of the references (app A) are commercially available and are sources for information on the hazards of commercial chemicals.

c. Biological Material. Any biological material that is shipped within CONUS will be limited to

small quantities that are required for defense research. The hazards of biological material are unique in that it is made up of living microorganisms. The type of hazard will vary with the material encountered. The technical escort personnel accompanying shipments should be consulted to determine the hazards associated with a particular type of biological material or etiological agent. TM 3-216 contains information on the technical aspects of biological material.

10. Protective Measures

a. If CB contamination is suspected, protective masks and protective clothing will be worn when approaching the accident site. The site should be approached from upwind, avoiding visible concentrations of liquids, powders, and smoke.

b. When the specific chemical or biological hazard is known, the recommended protective clothing, as indicated in table 3, should be worn when entering the contaminated area. The minimum protective uniform, as indicated in table 3, may be worn when the type of hazard is initially unknown and speed in identification is necessary.

c. A hot line (fig. 11) will be established as the downwind boundary of the command post (CP) complex. It is a selected control line separating the contaminated area from the uncontaminated area. The hot line must be initially established in an uncontaminated area, upwind of the accident or incident site, and should be a minimum of 50 meters downwind from the actual command post. A personnel decontamination station (PDS) will be established at a point on this line and utilized as a control point. All personnel and equipment entering or leaving the area will be channeled through the control point.

d. Before personnel enter the contaminated area, all clothing and equipment will be checked for completeness and serviceability. This check should be made at the hot line by the team member(s) designated to operate the personnel decontamination station.

e. Eating, drinking, and smoking will not be permitted in the contaminated area. Foodstuff and smoking material will not be carried into the

contaminated area. Unnecessary contact with possible contaminated surfaces (puddles, powder spills, and vegetation) should be avoided.

SECTION IV

CBR TEAM

(STANAG 2002)

11. General

A CBR team is a specially trained and equipped unit capable of responding to any accident/incident involving hazardous chemical or biological material. This team may also be designated the CBR Alpha Team when given the additional capability and responsibility for alpha monitoring.

12. Mission

a. The mission of the CBR team is to—

- (1) Assist technical escort teams.
- (2) Determine the extent of the hazard.
- (3) Identify the chemical agent involved.
- (4) Direct the survey, mark and record the contaminated area, and take samples of biological material.

(5) Recommend procedures for controlling movement of personnel and equipment into and out of the contaminated area.

(6) Decontaminate personnel, equipment, structures, and land surfaces as directed.

b. The CBR team chief, in conjunction with technical representatives from Edgewood Arsenal and other Government agencies as appropriate, will advise the chemical-biological accident/incident control officer (CBAICO) when the hazard has been sufficiently reduced to allow unprotected personnel to enter the area.

13. Organization

a. The CBR team should consist of a minimum of one officer and six enlisted men when the team does not have an area decontamination responsibility. When the CBR team is assigned an area decontamination responsibility, it should be augmented with at least four additional enlisted men to form a decontamination section (para 17-22).

b. The personnel of the CBR team should be assigned duties as follows:

(1) *Team leader.* The team leader is responsible for the operation of the team and will locate

himself in the position most advantageous for the successful completion of the team mission.

(2) *Assistant team leader.* The senior enlisted man will be assigned duties as the assistant team leader and must be capable of assuming the team leader's responsibility when necessary. In addition, he is responsible for operating the team command post and for supervising personnel of the decontamination station, the detection teams, and the decontamination section, as required.

(3) *Personnel decontamination station operators.* At least two men should be assigned to set up and maintain the personnel decontamination station. They will inspect personnel entering the exclusion area for the proper uniform. They will insure that proper decontamination procedures are used by personnel leaving the exclusion area, and insure that all equipment being removed from the exclusion area is decontaminated before crossing the hot line. The uniform for the PDS operators will be the minimum protective clothing (table 3) unless other clothing is designated by the team leader.

(4) *Detection teams.* Two detection teams with a minimum of two men each will be assigned to perform detection, identification, and survey of the contaminated area. One detection team will be composed of the team leader or assistant team leader and one other team member. The uniform for the detection team members will be designated by the CBR team leader. As the minimum, each detection team will carry detection and/or sampling equipment, appropriate first-aid material, marking equipment, and a means of communication. A small amount of general purpose decontaminant may be carried by the teams; or if the nature of hazardous material is known, the specific decontaminant may be selected.

c. When the CBR team is given an area decontamination capability and augmented with additional personnel, a decontamination section should be formed. A minimum of four men will be assigned to perform decontamination of equipment,

structures, and land surfaces under the supervision of the assistant CBR team leader. The section members will operate and maintain the decontaminating equipment on hand and perform the recheck of the contaminated area. The uniform for decontamination operations will be designated by the CBR team leader. Paragraph 19b describes duties of the individual members.

d. All team members will be qualified in the detection and identification of chemical agents; in the sampling of biological material; and in the decontamination of personnel, equipment, and CB material. At least four enlisted men should be qualified driver/radio operators. All members will be cross-trained to perform any task assigned. The team leader will coordinate the activities of the CBR team with other emergency teams at the accident site and furnish advice to personnel on chemical detection, biological sampling, survey procedures, and emergency decontamination measures.

14. Equipment

See section VI.

15. Training

a. Individual team members will be trained at a CBR school conducted at installation, brigade, or higher level.

b. Team training will be conducted at least quarterly (AR 50-21), and should be in conjunction with the training of other emergency teams. A suggested training program is summarized in table 1.

16. Utilization

a. Major commands with area chemical-biological accident/incident control responsibilities will organize and train CBR teams, as necessary, to insure arrival of a team at the scene of a CB

accident or significant CB incident within 4 hours (under normal weather conditions) after notification is received. Waivers to response time may be granted under the provisions of AR 50-21.

b. Upon arriving at the accident site, the CBR team leader will report to the CBAICO and coordinate with other emergency teams present, i.e., explosive ordnance disposal (EOD), fire, or medical. If the CBR team is the first to arrive at the site, and the technical escort leader is not present, the team leader will assume responsibility for emergency actions until properly relieved. The team leader will also insure that the command post location is checked for contamination (para 27) and that the initial hazard area is established (app B). These functions will normally be accomplished by EOD personnel.

c. After coordination with other emergency teams, the CBR team will:

(1) Assist the EOD team in the operation of the PDS and assume control of the PDS after the EOD team has accomplished its mission.

(2) Establish a PDS if the EOD team has not arrived.

(3) Move into the area to identify the hazard and locate areas of contamination.

(4) Mark all areas of contamination conspicuously.

(5) Assist in the decontamination of personnel, animals, and equipment found in the contaminated area.

(6) Within the team capability, decontaminate the area or advise and assist as directed by the CBAICO.

d. When dealing with civilian personnel, team members should not alarm or frighten them unnecessarily. Assistance of the civil authorities should be utilized, especially for controlling civilian personnel in the area.

e. Relationship with news media personnel is prescribed in AR 360-5 and AR 360-41.

Table 1. Suggested Training for CBR Team and Decontamination Team

Period	Hours	Subject	Scope	References
1	1	Orientation	Definition of terms; description of chemical-biological accident/incident control plan (CBAICP) in Army basic plan concerned.	FM 3-21; CBAICP of pertinent Army basic plan, AR 50-21, AR 385-40.
2	1	Chemical/Biological Material and First-Aid Procedures.	Types of chemical and biological material that may be encountered; hazards and first aid for these types of material.	FM 21-11, FM 21-40, FM 21-41, FM 21-48, TM 3-215, TM 3-216, TM 8-285.
3	1	Detection, Identification, and Sampling.	Procedures and techniques in detection and identification of chemical material; sampling of biological material.	FM 3-21, TM 3-215, TM 3-216, TM 3-6665-254-12, TM 3-6665-268-10.

Table 1. Suggested Training for CBR Team and Decontamination Team—Continued

Period	Hours	Subject	Scope	References
4	1	Protection.....	Protection and protective clothing required for CB hazards.	FM 3-21, FM 21-40, TM 3-215, TM 3-216, TM 10-277.
5	2	Decontamination.....	Procedures and techniques of personnel and area decontamination, and decontamination of equipment.	FM 3-21; TM 3-220, TM 3-250.
*6	4	Operation and Maintenance of Power-Driven Decontaminating Apparatus (PDDA).	The operation and organizational maintenance of a PDDA.	TMs for PDDA on hand; ASubjSed 3-2; ASubjSed 3-54B20.
7	1	Radio/Telephone Procedures....	Military radio/telephone procedures and operation of communications equipment on hand.	FM 24-18; TMs for equipment on hand.

*Applicable when a CBR team is augmented with a PDDA.

SECTION V

DECONTAMINATION TEAM/SECTION

17. General

Major commanders with area chemical-biological accident/incident control responsibilities may desire to organize and train decontamination teams in lieu of assigning the CBR teams an area decontamination responsibility.

18. Mission

The mission of the decontamination team/section is to:

- a. Decontaminate personnel, equipment, structures, and land surfaces.
- b. Recheck areas for completeness of decontamination.
- c. Perform other duties as assigned by the CBAICO.

19. Organization

a. The decontamination team should consist of a minimum of one officer and six enlisted men. Personnel should have the same qualifications as those of the CBR team. At least two of the enlisted men should be qualified drivers/decontamination equipment operators. All personnel should be cross-trained to perform any task assigned in the team. The decontamination team leader will coordinate the actions of the team with other emergency teams at the accident site and furnish advice on decontamination procedures and additional support requirements. The CBR team leader will assume this function when the decontamination section is used rather than a team.

b. The personnel of the decontamination team are assigned duties as follows:

(1) *Team leader.* The team leader is responsible for accomplishing the decontamination mission. He will locate himself in the position most advantageous for controlling the team. He will designate the protective uniform to be worn by each team member.

(2) *Assistant team leader.* The senior enlisted man is assigned duties as the assistant team

leader and must be capable of assuming the responsibilities of the team leader. He should be able to make a reconnaissance of the contaminated area to evaluate the situation; devise a plan for the decontamination of personnel, equipment, structures, and land surfaces; supervise the operation and maintenance of decontaminating equipment; and assist in the recheck of the area. He will also assume the duties of one of the personnel in (4) or (5) below.

(3) *Personnel decontamination station operators.* Duties of the PDS operators are as cited in paragraph 13b(3).

(4) *Driver/equipment operator.* A minimum of two men will be assigned as the decontaminating equipment operator and vehicle driver. They will operate decontaminating equipment and insure that the proper mixing procedures are followed.

(5) *Sprayers.* A minimum of two men will be assigned as sprayers when a power-driven decontaminating apparatus is used. In addition, they will assist in the recheck of the area and be utilized in other capacities as directed.

20. Equipment

See section VI.

21. Training

a. The individual members of the decontamination team will be trained the same as are those of the CBR team (para 15).

b. Team training will also follow that of the CBR team, and the suggested training program (table 1) is applicable.

22. Utilization

a. Response times for the decontamination teams are designated by the commander having area CBAIC responsibility.

b. Upon arrival at the accident site, the team leader will report to the CBAICO. Coordination should then be made with the other emergency teams.

c. After coordination with other emergency teams, the decontamination team will:

- (1) Assume final control of the PDS.
- (2) With the CBR team leader, make a reconnaissance of the contaminated area and devise a plan for decontamination (para 36-40).
- (3) Advise the CBAICO of procedures recommended and additional support requirements.

(4) Conduct decontamination operations as necessary to eliminate hazards.

(5) After decontamination, conduct a recheck of formerly contaminated equipment and surfaces and decontaminate as required.

d. Relationship with news media personnel is prescribed in AR 360-5 and AR 360-41.

SECTION VI

EQUIPMENT

23. General

The equipment listed in table 2 represents essential items for the accomplishment of the assigned missions of the CBR team and the decontamination team/section. For extended or massive operations, both teams will require additional support which will be requested from the nearest military installation by the CBAICO. The equipment list

should be kept as small as possible consistent with accomplishment of team missions.

24. Transportation

Both the CBR team and the decontamination team should be provided transportation to maintain a high degree of mobility. The most expeditious mode of transportation will be utilized to move the teams to the accident site.

Table 2. Suggested Equipment for CBR Team and Decontamination Team ^{1 2}

Item No.	Item	Quantity	
		CBR Team	Decon Team /Sec
A. DETECTION AND IDENTIFICATION EQUIPMENT			
1	Kit, Chemical agent detector, ABC-M18A2.....	2	1/team, 1/sec
2	Kit, Sampling, CBR agent, M34.....	2	1/team
3	Kit, biological sampling, interim (fig. 3), optional.....	2	1/team
4	Paper, detector, ABC-M8.....	4	2/team
B. COMMUNICATIONS EQUIPMENT			
5	Radio/transmitter, AN/PRC-88 ³	3	2/team, 1/sec
C. DECONTAMINATING EQUIPMENT			
6	Power-driven decontaminating apparatus ⁴		1/team, 1/sec
7	Personnel decontamination station (app C).....	1	1/team
8	Decontaminating apparatus, portable, ABC-M11.....	4	4/team
D. PROTECTIVE EQUIPMENT			
9	Clothing, outfit, cml, protective liner (line 40710).....	1/mbr	1/mbr
10	Outfit, toxicological agents protective (TAP) ⁵	1/mbr	1/mbr
11	Overgarment, suit, cml, protective ⁶	1/mbr	1/mbr
12	Apron, TAP (line A87412).....	1/mbr	1/mbr
13	Coveralls, cloth, pr.....	2/mbr	2 mbr
14	Gloves, surgeons, pr.....	2/mbr	2/mbr
15	Gloves, cloth or canvas, pr.....	2/mbr	2/mbr
16	Mask, protective, field, ABC-M17 series (or equivalent).....	1/mbr	1/mbr
17	Mask, protective, special purpose, M9A1.....	1/TAP Outfit	1/TAP Outfit
18	Hood, field protective mask, M6A1.....	1/mbr	1/mbr
E. INDIVIDUAL EQUIPMENT ⁷			
19	Atropine, automatic injector.....	3/mbr	3/mbr
20	Individual decontaminating and reimpregnating kit, M13.....	1/mbr	1/mbr
21	First-aid packet, individual.....	1/mbr	1/mbr
22	Lensatic compass.....	2/team	1/team

See footnotes at end of table.

Item No.	Item	Quantity	
		CBR Team	Decon Team /Sec
23	Canteen w/cup.....	1/mbr	1/mbr
24	Pistol belt.....	1/mbr	1/mbr
25	Poncho.....	1/mbr	1/mbr
26	Flashlight w/batteries.....	1/mbr	1/mbr
27	Entrenching tool.....	1/team	1/team

MARKING EQUIPMENT

28	Tape, textile, white, herringbone weave (engineer), ¾ inch wide, ft.....	5,000	-----
29	Chemical and biological hazard marking signs w/stakes.....	As rqr	-----

G. DECONTAMINANTS

30	Supertropical bleach.....	50 lb	As rqr for PDDA on hand.
31	Antiset.....	-----	As rqr for PDDA on hand.
32	DS2.....	5 gal.	20 gal.

H. ADMINISTRATIVE AND MISCELLANEOUS EQUIPMENT AND SUPPLIES *

33	Notebook; road maps of area of responsibility.....	As rqr	As rqr
34	Paper; pencils; acetate; grease pencils; tape, masking, 1-2-3 in. rolls; plastic bags, large, medium, small; foot lockers; spare batteries for radios and flashlights; rakes; shovels; brooms.....	As rqr	As rqr

* Based on team strengths cited in this manual.

* CBR teams with alpha monitoring responsibility may have items of equipment listed in FM 3-15. Only those items not duplicated should be procured.

* The AN/PRC-88 radio/transmitter set is safe to use in the vicinity of explosives. The AN/PRC-88 consists of the AN/PRR-9 receiver and the AN/PRT-4 transmitter. AN/PRC-6 radio is a suitable substitute.

* The M12A1 decontaminating apparatus requires vehicular support for mobile operations.

* TAP outfit as listed in TM 10-277. Individual and unit clothing and equipment cited are for technical mission use.

* Standard A, AMCTC item No. 8097.

* Personal clothing and sundry requirements should support team members for 72 hours.

* Toll tickets and Bell system and POL credit cards are recommended where feasible.

SECTION VII

DETECTION

(STANAG 2137)

25. General

Normally, the CBR team can expect to be briefed at the assembly area by the CBAICO and at the site by technical escort personnel or the EOD team commander as to the type of agent involved. However, there may be an accident/incident where these teams are not present, and the CBR team leader must determine the type of agent involved. In any event, it is the function of the CBR team to determine the extent of contamination and confirm the type of chemical material involved.

26. Protective Clothing

The items of protective clothing recommended for protection against chemical and biological hazards are summarized in table 3. The team leader can readily select the items required for protection against the hazard present.

a. Known Hazard. If the type of agent is known, the CBR team may dress in the protective clothing most suitable for protection against that hazard (table 3).

b. Unknown Hazard. If time is of essence and if the type of agent is unknown, the team leader may choose to send a detection team (minimum of two men), dressed in minimum protective clothing, into the contaminated area to facilitate quick identification. Once the contaminant is identified, the remainder of the team must dress in the most suitable protective clothing. If the contaminant cannot be identified, it will be assumed to be the most hazardous, and the butyl rubber suit with impregnated undergarments or liner should be worn.

27. Detection at Command Post Location

When it is initially unknown as to whether explosives are involved in an accident, or the quantity of explosives involved is not known, the command post complex will be located approximately 450

meters upwind of the site to insure that it is out of the fragmentation range and free of contamination. EOD personnel are qualified to determine the distance that the CP should be from the site, once the quantity of explosive is determined. EOD personnel will normally check the CP area for contamination. However, the CBR team may be required to perform this function. When this is the case, two individuals, dressed in field clothing with protective mask, protective gloves, and boot covers, will conduct tests with a chemical agent detector kit. All other personnel will be in protective masks until the "All Clear" is given. (See FM 21-40, para 4-12A(1) for additional information on unmasking procedures.) The surface of the ground should be visually checked for obvious liquid contamination and should be sampled with ABC-M8 chemical agent detector paper. A minimum of three aerosol/vapor checks, using the enzyme detector ticket, should be made approximately 50 meters apart (fig. 1) for nerve agents. Other vapor tests (blue, yellow, green, and red band tube tests) need be accomplished only once, in the center of the area. If the contaminant is known, tests need be made only for that material. Periodic checks of the wind direction will be made at approximately 30-minute intervals to insure that the CP remains upwind of the site as long as a downwind hazard exists. See TM 3-6665-254-12 for use of the ABC-18A2 chemical agent detector kit.

28. Detection in the Hazard Area

a. Upon entry into the exclusion area, the detection teams will be concerned mainly with confirming if a downwind hazard exists, and the amount of liquid contamination on surfaces. One detection team should begin at the control point on the hot line or 0° from the site, and the second team should move around outside the exclusion area and begin at the opposite side on 180° from the site (fig. 2). When liquid contamination is encountered, the detection teams should mark it with the

Table 3. Recommended Protective Clothing

Clothing	Hazard						
	Nerve agent	Blister agent	Liquid biological material	Blood and choking agents	Dry biological material and incapacitating agent and RCA	Liquid smoke	Rocket fuels and oxidizers
Impregnated undergarments (drawers, shirt, socks, gloves, or liner).....	X ¹	X					
Coveralls, TAP (cooling suit as rqr).....	X	X	X				
Coveralls, RFH (cooling suit as rqr).....							X
Coveralls, explosive handler's*.....	X ²		X ²	X ²	X ²	X ²	X ²
Boots, TAP ³	X	X	X				X
Boot covers, TAP*.....	X	X	X	X	X	X	
Boots, combat*.....				X	X	X	
Field clothing, environmental*.....	X ²		X ²	X ²	X ²	X ²	X ²
Hood, TAP*.....	X	X	X				
Hood, M6A2*.....				X	X ⁴	X	
Hood, RFH.....							X
Protective mask, field, ABC-M17 series* ⁵				X	X	X	
Protective mask, special purpose, M9A1* ⁵	X	X	X				
Self-contained breathing apparatus ⁶							X
Gloves, cotton*.....				X	X		
Gloves, surgeon's or plastic.....	X		X			X	
Gloves, TAP*.....	X	X	X	X	X	X	
Gloves, RFH, gray.....							X
Gloves, RFH, red.....							Oxidizers
Gloves, RFH, green.....							Fuels
Apron, TAP*.....				X ⁷	X ⁷	X	

*Minimum protective clothing.

RCA—riot control agent; TAP—toxicological agents protective; RFH—rocket fuel handler's.

¹ V-series only.

² Either item may be worn.

³ Boots, rubber, may be substituted, if boot cover, TAP, is worn.

⁴ Hood or surgeon's cap.

⁵ Either mask with appropriate hood may be worn.

⁶ Self-contained breathing apparatus should be used in place of protective mask when in oxygen-deficient atmosphere or in closed areas where high agent concentrations may exist.

⁷ Apron, TAP, used for protection against liquid decontaminants.

appropriate hazard sign or a stake with engineer tape (FM 21-40). The team should not proceed farther into the area but should return to the boundary of the exclusion area and proceed back toward the contamination site at a different angle until contamination is again found. This procedure should be repeated 360° around the exclusion area. This is the same type of procedure called the "in-and-out method" in paragraph 45, FM 3-15.

b. On the downwind side of the site, 90° to 270° frequent aerosol/vapor tests should be made for the specific agent to confirm if a downwind hazard exists. If a downwind hazard is confirmed, tests should be made farther downwind to establish the extent of travel. This distance will be established by the CBAICO.

29. Recheck

After area decontamination (para 36-40), a recheck of known contaminated locations should be made to insure that the area is safe for normal use. Caution must be used when ABC-M8 detector paper is used for rechecking as some decontami-

nants may cause a color change; for example, DS2 turns M8 detector paper greenish-black.

30. Unknown Chemical Material

a. Normally, chemical material can be identified by either the technical escort personnel, the shipper, or the shipping documents. However, when identification of a chemical material has not previously been made and it cannot be made with the chemical agent detector kit or by any other means available at the site, aerosol/vapor samples of the material should be taken with the white band tubes. Samples of the material should be sealed in test tubes or other suitable containers. The M34 CBR agent sampling kit may be used for this purpose.

b. Decontamination of an unknown chemical should be accomplished by the use of a general purpose decontaminant such as supertropical bleach or DS2. Following decontamination, samples should be collected again to insure complete decontamination once the material has been identified.

c. The Commanding Officer, Edgewood Arsenal, Maryland, should be contacted for instructions

for the disposition of all unknown chemical samples.

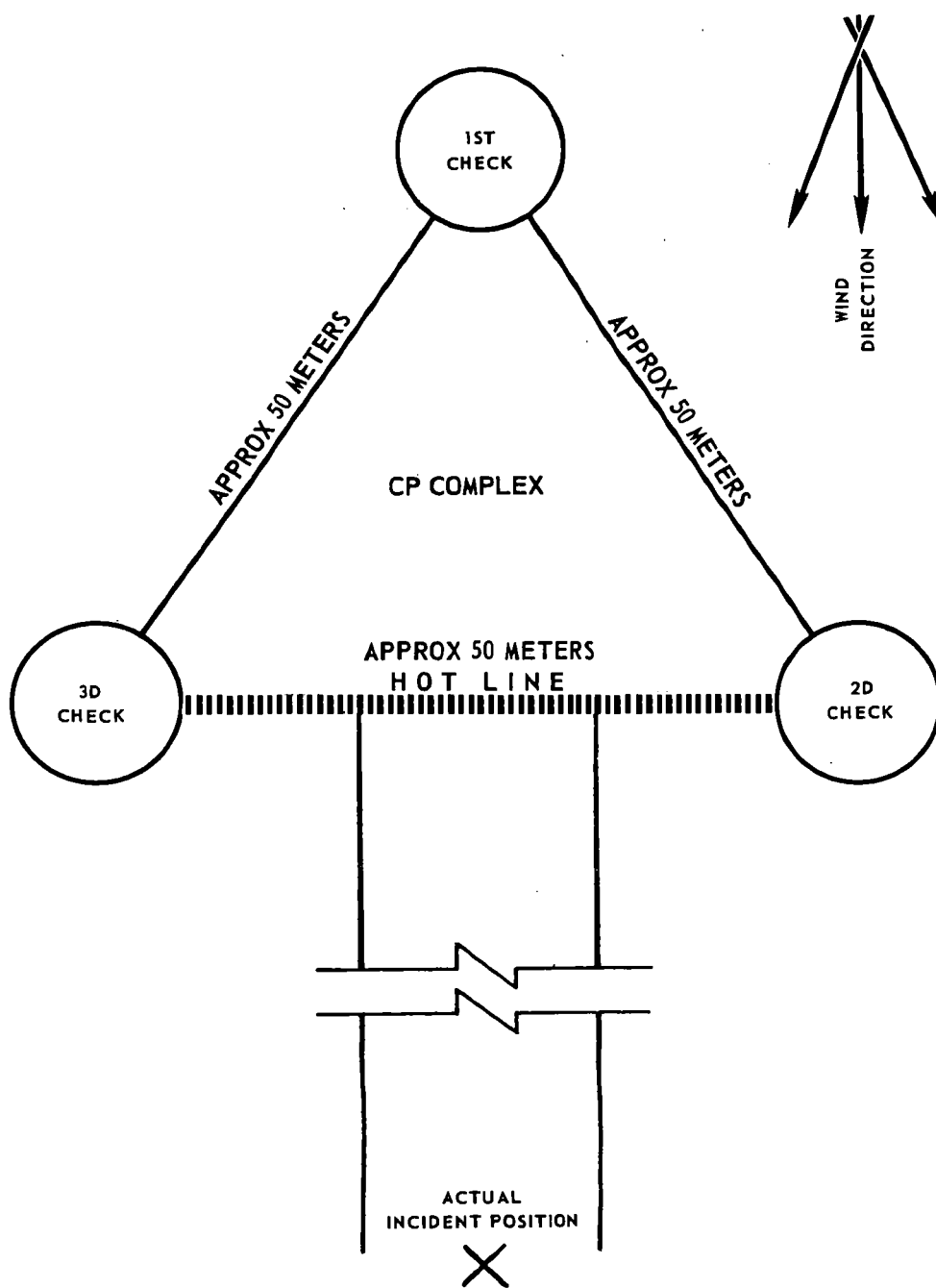


Figure 1. Check points for setting up the command post area.

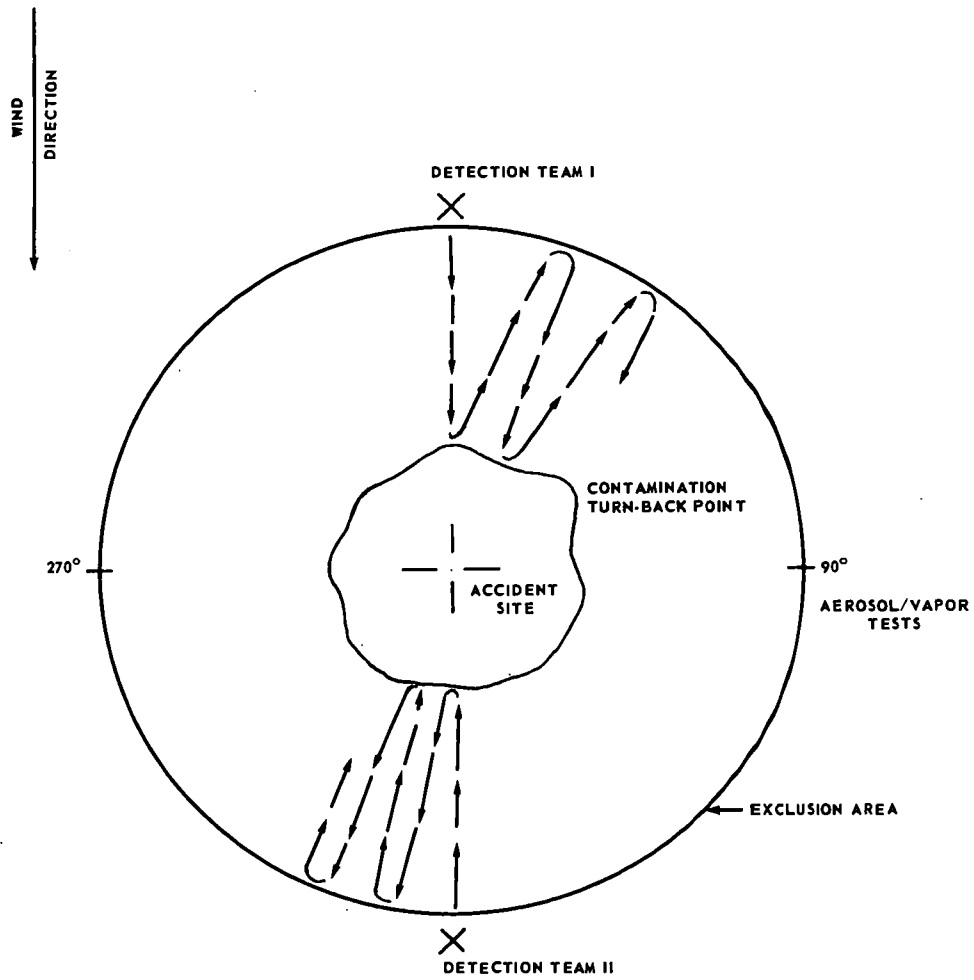


Figure 2. In-and-out method.

SECTION VIII

BIOLOGICAL SAMPLING

31. General

Biological material presents an additional problem in that it cannot be detected or identified by means currently available in the field. The identification of the material involved in an accident may be obtained from either technical escort personnel, the shipper, or the shipping documents; however, this information may not eliminate the need for sampling. The M34 CBR agent sampling kit is the standard biological sampling kit. If the M34 CBR agent sampling kit is not available, it is possible to construct an interim sampling kit.

32. Biological Sampling Kits

a. *M34 CBR Agent Sampling Kit.* TM 3-6665-268-10 describes the M34 CBR agent sampling kit and provides information for its use. The water and soil samples outlined in the technical manual may not be desirable because the natural organisms found in water or soil may mask the organism that is being sampled. With a minor addition of equipment, test tubes, as those described in *b* below, may be used with the M34 CBR agent sampling kit.

b. *Biological Sampling Kit, Interim.* The biological sampling kit, interim (fig. 3) is assembled from readily available materials; the tubes, pipettes, swabs, and tweezers may be obtained from medical facilities.

(1) *Case.* The case may be fabricated locally, or the carrier of an AN-M15A2A chemical agent detector kit may be used.

(2) Contents.

(a) *Sampling tubes* (fig. 4). The kit should hold a minimum of ten sampling tubes (preferably sterile), as follows:

1. Three test tubes with caps for the collection of solid (fragment) samples (para 33d).

2. Three test tubes with caps, each containing a small glass pipette for the collection of liquid samples (para 33c).

3. Three test tubes with caps, each containing a cotton swab, for the collection of surface

samples (cotton swab, FSN 6515-303-8250) (para 33b).

4. One test tube with cap, containing sterile water to be used to moisten the cotton swab when sampling powdered material.

(b) Other components.

1. One pair small tweezers for collecting samples.

2. One grease pencil for marking sampling tubes.

3. One pencil.

4. One note pad.

5. Two plastic bags for collecting large solid samples.

6. Additional test tubes may be required if the material has been spread over a large area.

33. Procedures

a. *General.* Biological material cannot be detected in the same manner as chemical agents; therefore, sampling should be conducted by beginning at the site itself and expanding outward and downwind as the situation warrants (fig. 5). Samples should be taken before decontamination and again from the same locations after completion of decontamination. These samples will be used to verify and/or identify contamination and to insure that decontamination was complete. Sampling at the site will be conducted only after the EOD team leader determines that the area is free of explosive hazards.

b. *Surface (Swab) Sample.* Remove the swab from the tube, and take the sample by making a "Z" pattern on any suspected surface while rotating the swab between the fingers. Replace the swab in the tube, recap, and mark. This sample can be used for either liquid or powdered material. Prior to sampling a powder, dip the end of the swab in the sterile water tube to moisten it.

c. *Liquid Sample.* Remove the glass pipette from the tube, submerge the bottom end of the pipette in the liquid, place finger over the top of the pipette, withdraw from liquid, place pipette

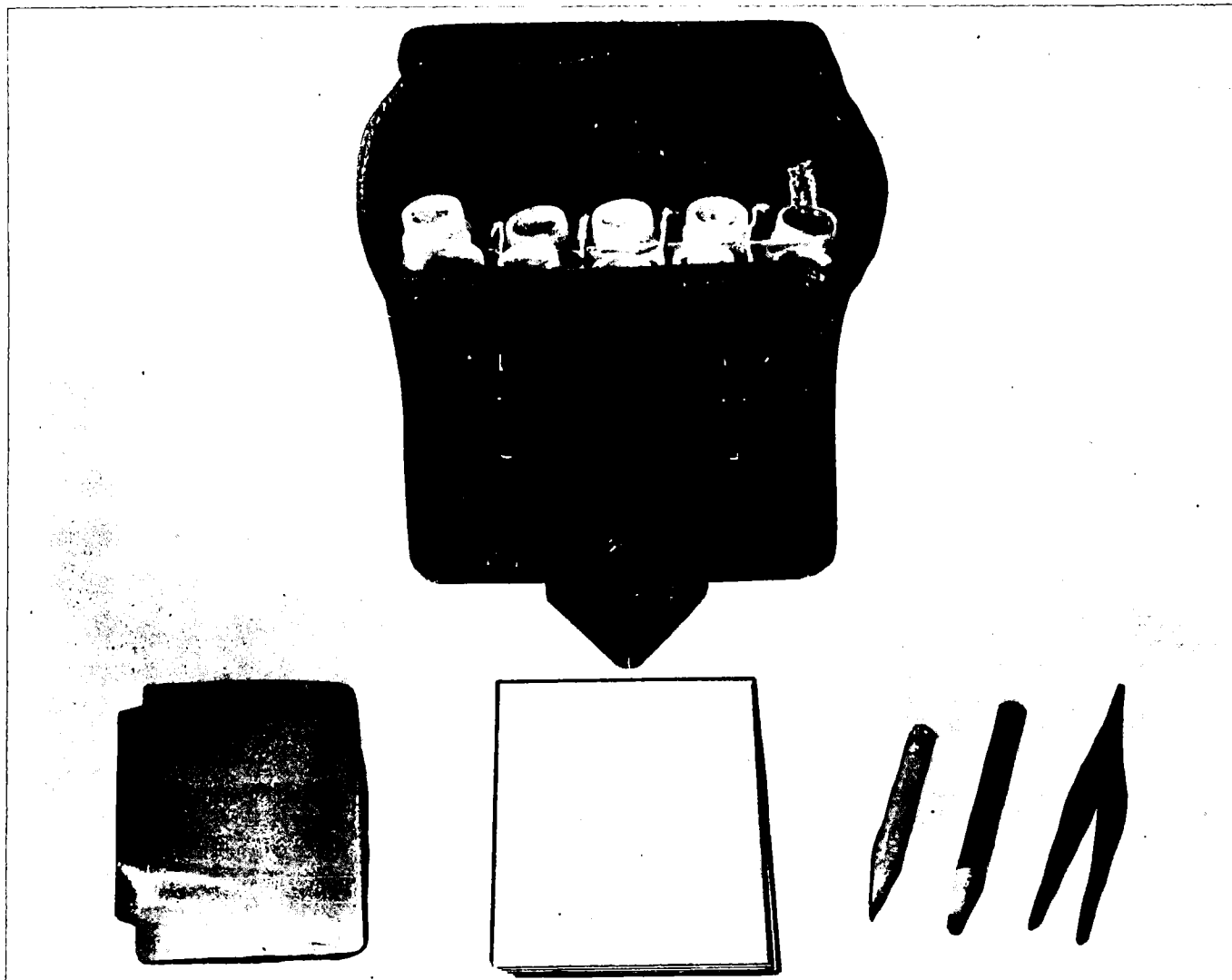


Figure 3. Biological sampling kit, interim.

and liquid in the test tube, recap, and mark. This sample is used only for liquid material.

d. Solid (Fragment) Sample Collect fragments of containers, vegetation, or twigs with the tweezers, place sample in the tube, recap, and mark. This sample may be used for either solid, liquid, or powdered material. SOIL SAMPLES SHOULD NOT BE COLLECTED BECAUSE THE NATURAL MICROORGANISMS FOUND IN SOIL MAY MASK CULTURES.

34. Marking

a. The suspected contaminated area should be marked with the appropriate hazard sign or with engineer tape on stakes (FM 21-40).

b. Sampling tubes should carry the information below as a minimum; additional information may be recorded if deemed necessary.

(1) Date and time of sampling.

(2) Type of sample (liquid, solid, swab).

(3) Location where sample was taken (coordinates, from container, vegetation, distance from site, etc.).

(4) When sample was taken (before or after decontamination).

(5) Identification of material (if known).

35. Identification

The Medical Laboratories, Edgewood Arsenal, Maryland, are responsible for processing biological material samples. All samples should be shipped to this organization in accordance with AR 55-16. Information may be obtained from the CBAICO, the technical escort representative, or by calling Edgewood Arsenal.

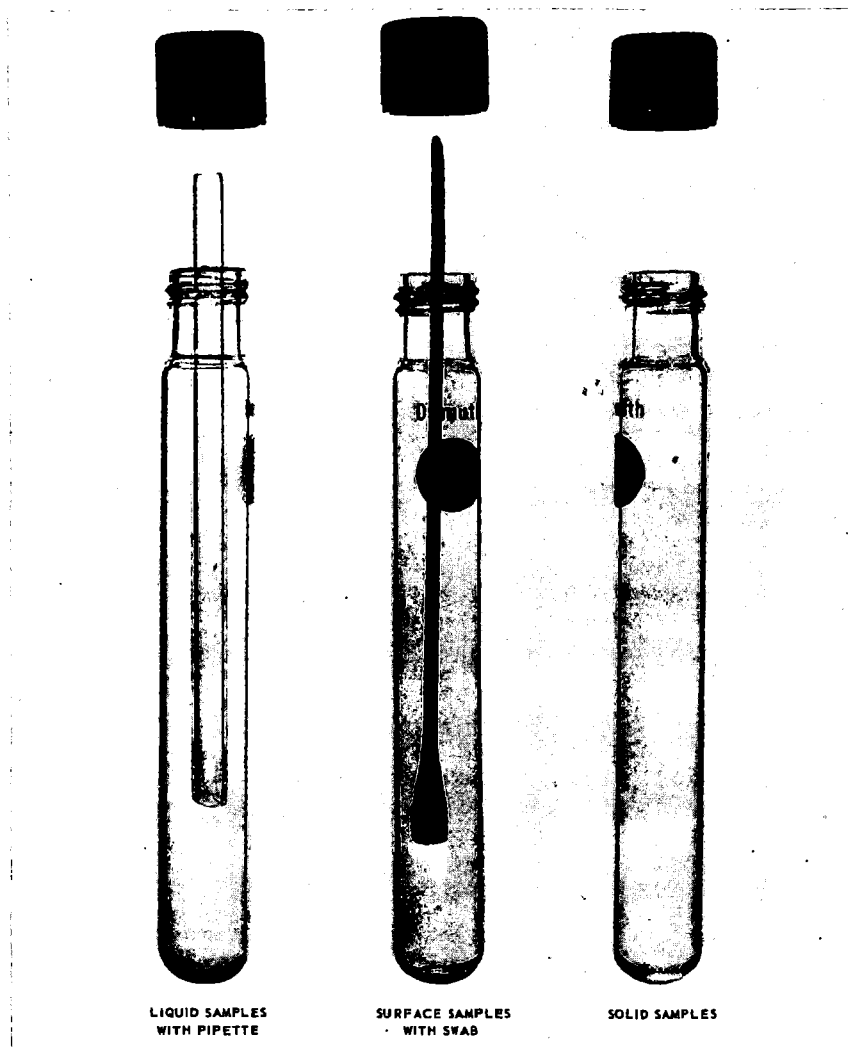


Figure 4. Sampling tubes.

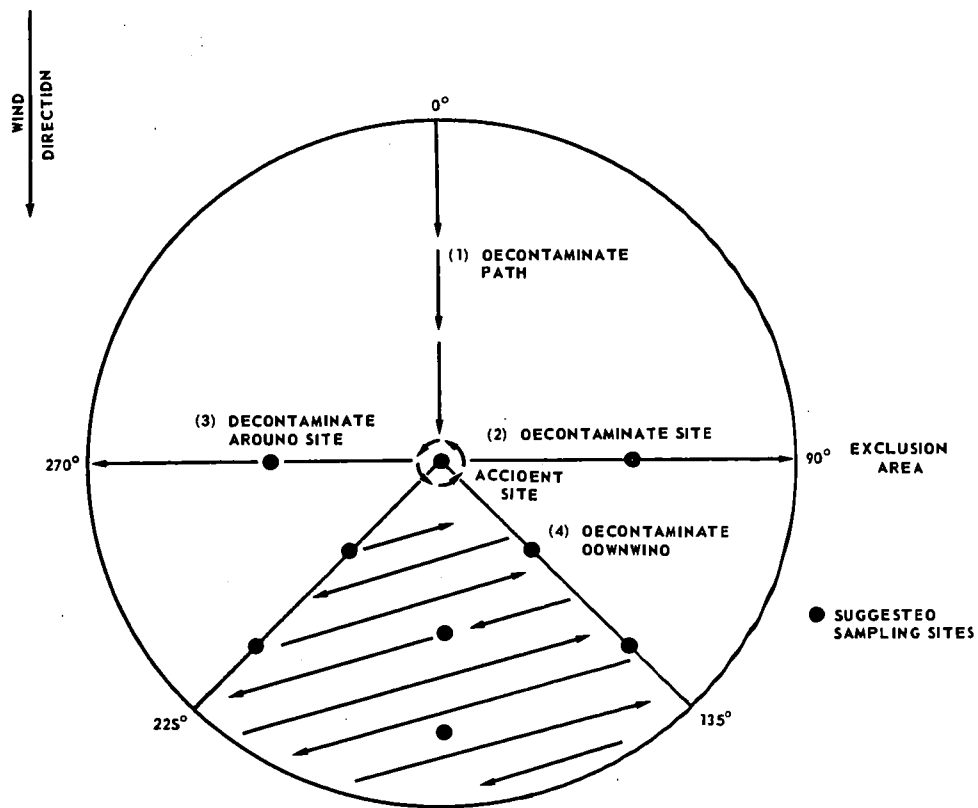


Figure 5. Biological sampling and decontamination.

SECTION IX

DECONTAMINATION

36. General

Emergency teams usually will have to be augmented with specialized equipment before large-area decontamination can be accomplished. Team leaders normally will be required to provide advice on decontamination procedures and will supervise decontamination operations.

37. Personnel decontamination

a. One of the first priorities at any CB accident site is to insure that personnel found in or leaving the suspected contaminated area are properly decontaminated. The PDS is used for this purpose. It is established as a control point on the hot line to prevent the spread of contamination. It should be located outside the contaminated area. However, the first stages of decontamination occur on the "hot side" of the hot line.

b. A typical PDS is shown in figure 6. The actual arrangement will depend on the type and amount of hazardous material involved and the equipment available. Four general principles should be followed when establishing the PDS:

(1) Move into the wind as undressing progresses.

(2) Decontaminate and remove the most heavily contaminated items first.

(3) Follow the undressing sequence and procedures shown in figure 6 as closely as possible. All articles of clothing worn at the site will be removed and decontaminated.

(4) Remove the protective mask as the last item just before showering.

c. The recommended items for the setup and the sequence of operation of the PDS are found in appendix C, along with an explanation of the individual stations.

38. Area and Equipment Decontamination

Since the types of equipment, surfaces, and hazardous material to be decontaminated will vary with each separate accident, TM 3-220 should be

referred to before starting decontamination operations.

39. Decontaminants

Decontaminants are listed in table 4 for hazardous material that may be encountered and in the order of preference for each hazard. Decontaminants not on hand may be acquired through local supply channels. Table 5 lists the mixing ratio and use of decontaminants for small amounts or when a power-driven decontaminating apparatus (PDDA) is not available. Mixing ratios for PDDAs can be found in applicable technical manuals.

40. Methods

Decontamination means neutralizing or removing the contaminant. Allowing the contaminant to weather will not normally be acceptable for hazardous chemicals or biological material at an accident site.

a. Neutralizing.

(1) Neutralizing is an excellent method of eliminating the hazard presented by the contaminant. Certain factors must be considered before neutralization procedures are begun.

(a) Type of hazard (liquid or solid).

(b) Type of surface (soil, vegetation, roadways).

(c) Type of decontaminant (best available).

(d) Method of applying decontaminant (PDDA, pump, bucket).

(2) Neutralization procedures for chemical contaminants should begin at the farthest point of contamination from the accident site and proceed inward, moving in a back-and-forth direction (fig. 7) or in a circular direction (fig. 8). To insure complete decontamination of the area, operations should begin several meters from known contaminated locations. When biological contamination is to be neutralized, a path to the site should first be decontaminated, followed by decontamination of the site, the area downwind of and around the

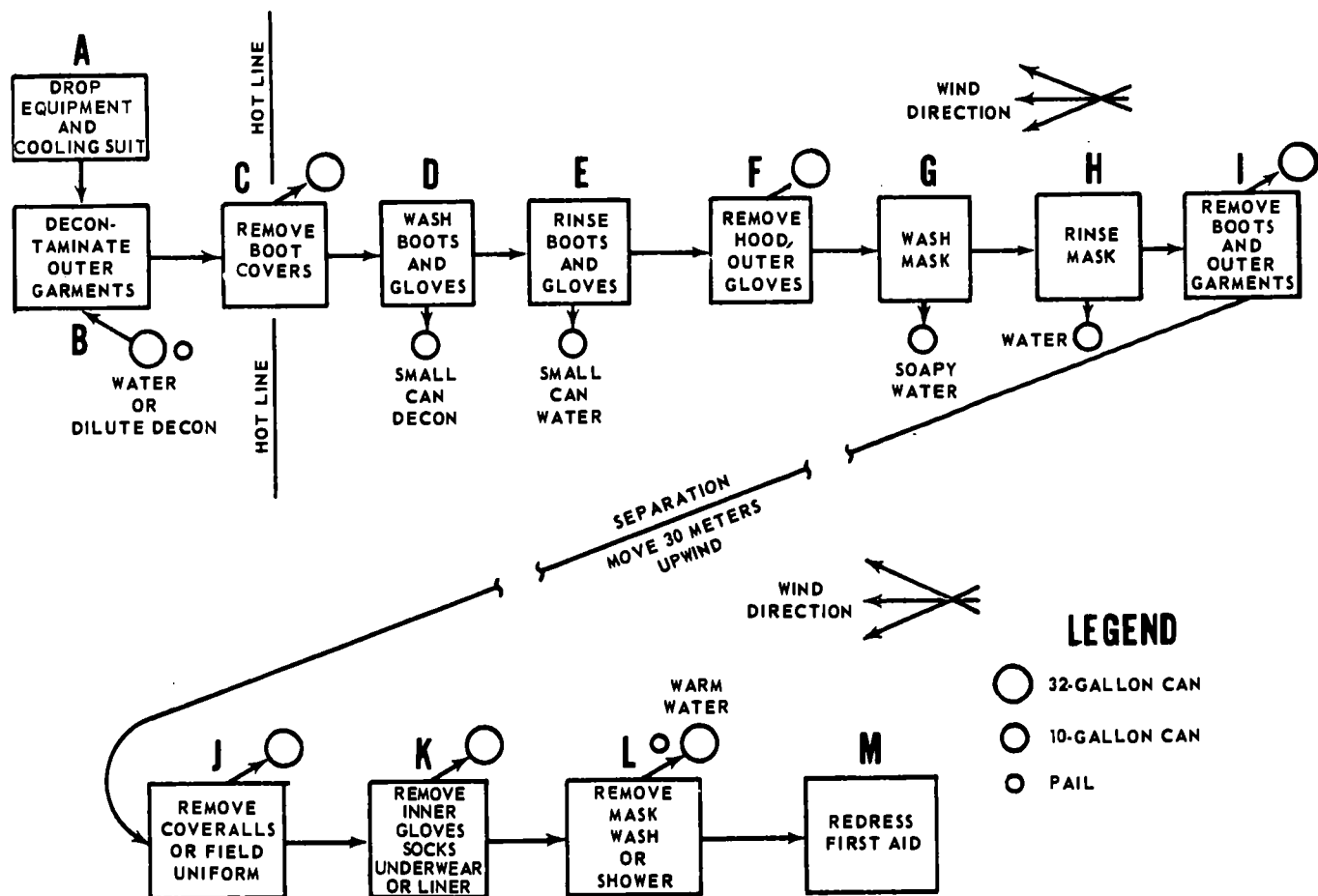


Figure 6. Personnel decontamination station.

Table 4. Decontaminants for CB Accidents/Incidents
(Listed in order of preference ¹)

Hazard	Decontaminant
Blister agents: H, HN, HD, HT, HL, L	1. HTH/HTB solution (calcium hypochlorite) 2. DS2 (decontaminating solution No. 2) 3. STB (supertropical bleach) slurry 4. DANC (decontaminating agent, noncorrosive) 5. Commercial or household bleach solution (sodium hypochlorite)
CX	DS2 (decontaminating solution No. 2)
Nerve agents: GA, GB	1. Caustic soda solution (sodium hydroxide) 2. DS2 (decontaminating solution No. 2) 3. Washing soda solution (sodium carbonate) 4. STB (supertropical bleach) slurry 5. Hot soapy water
VX	1. HTH/HTB solution (calcium hypochlorite) 2. DS2 (decontaminating solution No. 2) 3. STB (supertropical bleach) slurry 4. Commercial or household bleach (sodium hypochlorite) 5. DANC (decontaminating agent, noncorrosive) 6. Caustic soda solution (sodium hydroxide)

See footnotes at end of table.

Table 4. Decontaminants for CB Accidents/Incidents—Continued

Hazard	Decontaminant
Blood agents: AC, CK Choking agent: CG	1. DS2 (decontaminating solution No. 2) 2. Caustic soda solution (sodium hydroxide)
Riot control agents: DM, DA	1. DS2 (decontaminating solution No. 2) 2. Caustic soda solution (sodium hydroxide)
CS	1. DS2 (decontaminating solution No. 2) 2. Alcoholic caustic (alcohol mixed w/sodium hydroxide solution) 3. Hot soapy water 4. Sodium bisulfite solution, 5 percent
CN	1. Caustic soda solution (sodium hydroxide) 2. Washing soda solution (sodium carbonate) 3. Hot soapy water
Incapacitating agent: BZ	1. Alcoholic caustic (alcohol mixed w/sodium hydroxide solution) 2. Sulphuric acid solution, 1 percent 3. Hot soapy water
Biological material:	1. Caustic soda solution (sodium hydroxide) 2. HTH/HTB solution (calcium hypochlorite) 3. STB (supertropical bleach) slurry 4. DS2 (decontaminating agent, solution No. 2) (not effective for bacterial spores) 5. DANC (decontaminating agent, noncorrosive) 6. Sodium hypochlorite solution (household bleach) 7. BPL (betapropiolactone) (vapor phase decontaminant) 8. ETO (ethylene oxide) (vapor phase decontaminant) 9. PAA (peracetic acid) (2 to 3 percent concentration; effective for bacterial spores) 10. Hyamine (0.1 to 1 percent concentration; not effective for bacterial spores)

¹ The decontaminant selected depends on the type of material to be decontaminated.

Table 5. Mixing of Decontaminants

Decontaminant	Decontaminates	Mixing procedures	Contact time	Remarks
Supertropical bleach (STB).	Blister agents Nerve agents Biological material	Dry mix—2 shovels bleach to 3 shovels earth. Slurry mix—50 lb bleach to 6 gal. water.	Leave slurry on munition/container 30 minutes, then wash off with water and check for remaining contamination.	Pure STB will burn on contact with liquid blister agents. Gives off toxic vapors in contact with G-agents.
Decontaminating agent, noncorrosive (DANC).	Blister agents V-agents Biological material	Mix RH-195 (powder) with solvent, and stir thoroughly until completely dissolved.	Leave DANC on munition/container 30 minutes, then wash off with water and check for remaining contamination.	DANC will not decontaminate G-agents. Will cause color change if it comes in contact with chemical agent detector paper or crayon.
DS2 (decontaminating solution No. 2).	Will decontaminate all known toxic chemical agents, and most biological material (except spores) if sufficient contact time is allowed.	No mixing required. Issued in ready-to-use solutions.	Leave DS2 on munition/container 30 minutes (if possible), then wash off with water and check for remaining contamination.	Can be used at temperatures from -25° F. to 125° F. Considered a general purpose decontaminant. Will cause color change if it comes in contact with chemical agent detector paper or crayon. 1 1/3-qt can be used in ABC-M11 decontaminating apparatus.

Decontaminant	Decontaminates	Mixing procedures	Contact time	Remarks
Betapropiolactone (BPL).	Will kill all biological material, including spores (not effective against toxins).	No mixing required. Issued in ready-to-use solutions.	Leave on interior surfaces for 2 hours, then aerate building by opening windows.	BPL not recommended for outside use. Should be used in high temperature and high humidity. BPL is disseminated as an aerosol by means of an insecticide sprayer. Good vapor phase decontaminant for decontamination of interiors of buildings.
Sodium hydroxide in alcohol-water solution.	BZ CS Biological material	Mix 10 lb caustic w/12 gal. water and 12 gal. alcohol (methyl or ethyl). (See Remarks.)	Dissolve agent in solution and allow to stand 24 hours.	Dissolve caustic in water first, and allow solution to cool before adding alcohol. See Remarks on sodium hydroxide (caustic soda).
Sodium carbonate (washing soda).	CN G-agents	Mix 10 lb washing soda w/12 gal. water (10 percent solution).	Reacts rather rapidly for G-agents, normally within 5 minutes.	Possible sources. Commercial chemical firms and laundries.
Sodium hydroxide (caustic soda).	G-agents AC, CK CN All biological material, including spores.	Mix 10 lb of caustic soda w/12 gal. water (10 percent solution).	Destroys G-agents immediately on contact.	Mix caustic soda in an iron or steel container; do not use aluminum. When mixing, caustic soda should be added to water to prevent boiling and splattering due to the excessive heat formed when dissolving caustic. Possible sources. Commercial chemical firms, large manufacturers of metal products, commercial laundries, and drug stores.
Sodium hypochlorite solution (household bleach).	Blister agents V-agents Biological material	No mixing required	Reacts rather rapidly, normally within 5 minutes, upon contact with blister agents and V-agents.	Use full strength solution. Possible sources. Commercial laundries (10 to 14 percent solution). Food stores carry commercial brands of 5 percent solutions.
Calcium hypochlorite (HTH/HTB).	Blister agents V-agents All biological material, including spores.	Mix 5 lb (HTH/HTB) w/6 gal. water (10 percent solution).	Reacts rather rapidly with blister agents, normally within 5 minutes.	Prolonged contact time required for nerve agents and biological material. Will decontaminate same agents as STB; however, it is a stronger and faster acting decontaminant. Possible sources. Commercial laundries and chemical firms.

Decontaminant	Decontaminates	Mixing procedures	Contact time	Remarks
Lysol. Phenol. Formaldehyde. Paraformaldehyde.	Biological material and toxins.	Use "as is" or follow package instructions.	Contact time will depend upon type of biological material, temperature, and the decontaminant used.	Possible sources. Generally available from druggists for biological decontamination on small scale. As a vapor phase decontaminant, liquid formaldehyde may be disseminated by an insecticide sprayer or by a smoke generator. Formaldehyde is disseminated from paraformaldehyde by heating the dry powder to 450° to 500°F.
Ethylene oxide (ETO)	Biological material (not effective against toxins).	Available in pressurized aerosol cans. No mixing required.	6 to 8 hours at 70° to 80°F.	Decontaminant for clothing and equipment. Items worn next to the skin should be aerated at least 18 hours to prevent blistering of the skin. ETO is an effective vapor phase decontaminant.
Peracetic acid (PAA).	Biological material	Dilute to 2 to 3 percent water solution. Do not mix until ready to use because the solution decomposes on storage.	Normally, a 10-minute exposure is sufficient.	Vent cap on container must be replaced when it becomes corroded to prevent buildup of pressure. Keep away from open flame.
Hyamine.....	Excellent decontaminant for all biological material, except bacterial spores and toxins.	0.7 oz of hyamine + 5 gal. water = 0.1 percent solution. 7 oz of hyamine + 5 gal. water = 1 percent solution.	5 to 30 minutes	0.1 percent to 1 percent solution is effective, noncorrosive, and non-irritating.

site, and the points where samples were initially collected (fig. 5). The distances around and downwind of the site to be decontaminated will be determined by the CBAICO. Priority of decontamination should be given to the inside of vehicles and boxcars that may have been contaminated by biological material. A vapor phase decontaminant would normally be used for interior decontamination.

b. Removal. Decontamination by removal consists of physically removing the contaminant with or from the surface with which it is in contact.

With heavy liquid contamination on porous soil, this method may involve removal of several inches or possibly feet of soil. However, this method may be preferred in cases when powdered or frozen hazardous material cannot be feasibly decontaminated where it lies or when the material may have been absorbed by the surface with which it was in contact. Removal requires considerable equipment and manpower and is quite expensive as a decontamination method. Further, the contamination removed will still require decontamination by some other means.

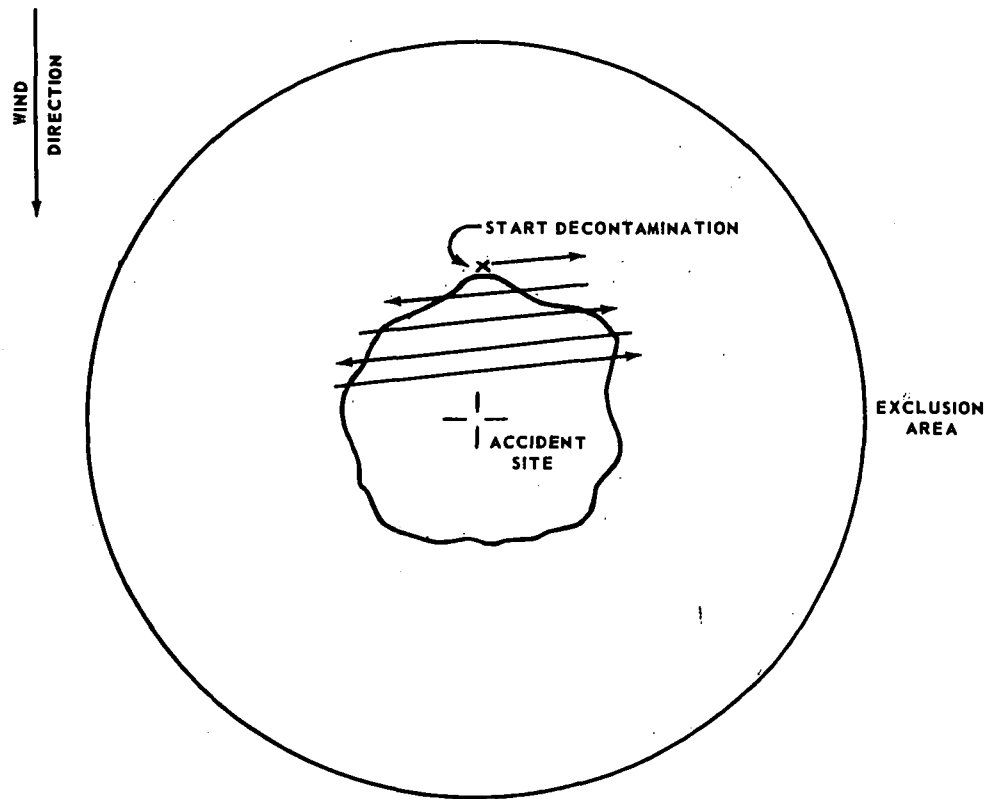


Figure 7. Area decontamination by the back-and-forth procedure.

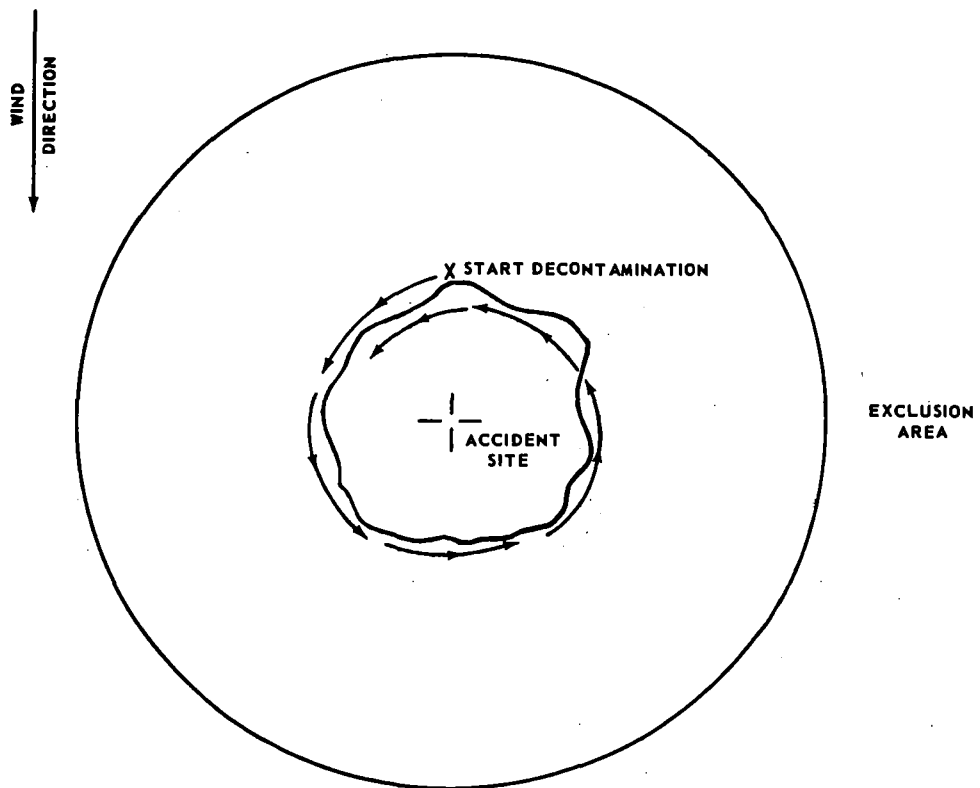


Figure 8. Area decontamination by the circular procedure.

SECTION X
CONTROL OF CB ACCIDENT SITE
(STANAG 2312, 2313, 2314)

41. General

a. Immediate control of a military chemical or biological hazardous material accident site will be established by the nearest military commander (para 4) pending arrival of the on-scene commander, the CBAICO, or the representative of the service having possession of the material. Control requirements will vary according to the magnitude of the accident effects.

b. In controlling the CB accident site, the first consideration is saving lives. Untrained military personnel or civilians may have performed some emergency actions in the contaminated area. These individuals should be detained and inspected for possible contamination and observed for effects of the material involved. Injured personnel requiring evacuation should be decontaminated as rapidly as possible, and local medical authorities should be notified of the possibility of contamination.

c. Fires in which high explosives are involved should not be fought except to save lives or with the advice of EOD personnel (TM 5-315).

d. The CBAICO will request additional support personnel as required from the nearest military installation to augment the emergency teams and to provide security and control of the area.

42. Control Organization (CBAIC Organization)

A CBAIC organization will be formed to control personnel, materiel, and CBAIC operations at the scene of a chemical or biological accident. Teams and equipment will be formed from local assets.

a. Minimum composition of a CBAIC organization should include the following:

(1) The CBAICO's staff which consists of a (an):

- (a) CBAICO.
- (b) Provost Marshal.
- (c) Staff Judge Advocate.
- (d) Information Officer.

(e) Communications Officer.

(f) Engineer Officer.

(g) Medical Officer.

(2) The supporting teams working under the direction of the CBAICO which consist of a (an):

(a) EOD Team.

(b) CBR Team.

(c) Medical Team.

(d) Security Team.

(e) Communication Team.

b. The CBAIC organization augmented by specialized teams is shown in figure 9.

c. All members of the CBAIC organization will be equipped with individual protective masks and three automatic atropine injectors, and will wear the field uniform during operations unless other types of protective clothing are needed. Other minimum essential equipment will be designated by the CBAICO.

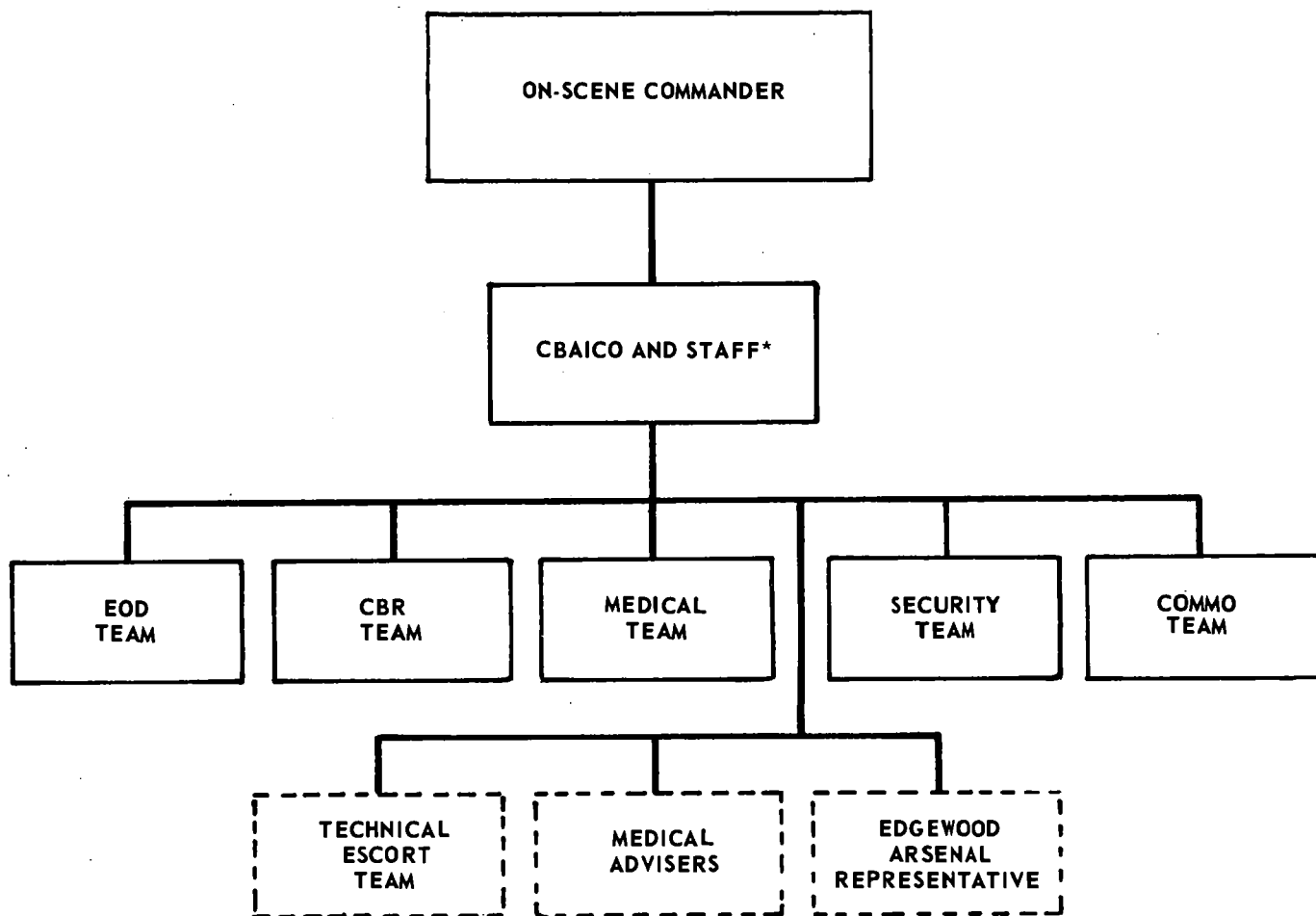
43. Control Measures

Upon arrival at the scene of the accident, the senior military representative will establish a command post to coordinate all activities directed toward control of the area. Control measures must be established for the area, for physical security and personnel, for traffic, and for contamination.

a. *Area Control.* The nature of the accident, meteorological conditions, and terrain conditions will determine the area control measures to be employed. The following guides should be used to establish the exclusion and downwind hazard areas.

(1) An initial exclusion area of 450 meters in radius should be established around the accident site (app B), when it is unknown as to whether explosives are or are not involved. After coordination with EOD personnel, the exclusion area may be adjusted.

(2) An initial downwind hazard distance of 2,000 meters should be established (app B) when the amount and/or type target are unknown. This



----- Technical expertise available upon request to advise at the site.

Figure 9. The CBAIC organization augmented by specialized teams.

area will be adjusted after coordination with EOD, technical escort, and CBR team leaders. Personnel entering this area for evacuation operations should wear protective masks.

(3) The CBAICO will make a determination of the areas that should be evacuated after evaluating reports from the emergency team leaders.

b. Physical Security and Personnel Control. The Provost Marshal will advise the CBAICO on physical security matters. He will coordinate the use of military security forces with representatives of state or local governments and with other military services (AR 50-21). Control of news media personnel will be coordinated with the information officer (AR 360-5 and AR 360-41).

(1) *Command post.* The command post will be established upwind from and a minimum of 50 meters outside the exclusion area. Control of

activities around the accident/incident site will be exercised from the CP.

(2) *Personnel decontamination station.* Personnel entering and departing the exclusion area will pass through the personnel decontamination station.

c. Traffic Control.

(1) Upon the report of an accident/incident, a designated military police unit will dispatch traffic control elements to the accident/incident area. These elements are under the control of the CBAICO once they arrive at the area.

(2) Traffic Control posts will be established at:

- (a) Entrances to and exits from the area.
- (b) Assembly areas.
- (c) Critical points.

(3) Traffic patrols will cordon off the area by their patrol activity and reroute traffic.

(4) A military police team will erect temporary direction signs, traffic signs, and contamination markers, as appropriate.

d. Contamination Control. Every effort should be made to contain the contamination within a localized area. Personnel and animals should be evacuated expeditiously.

(1) Personnel and animals evacuated from the immediate accident site should be inspected for contamination and processed through the PDS

as necessary. Personnel and animals evacuated from the downwind hazard area should be placed under observation. Identification of personnel and their location at the time of the accident/incident is essential to the processing claims.

(2) Equipment will be decontaminated in place or in a designated area established for that purpose.

(3) Leaking chemical munitions or containers of hazardous material should be leak sealed, packaged, and placed in a storage area by technical escort or EOD personnel until further disposition instructions are received.

APPENDIX A

REFERENCES

(STANAG 2154, 2312, 2313, 2314, 3400, 3571)

1. Department of the Army Publications

AR 11-17	Chemical Surety Program.
AR 50-21	Chemical and Biological Surety Program, Chemical-Biological Accident and Incident Control (CBAIC).
AR 55-16	Movement of Cargo by Air and Surface—Including Unit and Parcel Post Shipments.
AR 55-56	Transportation of Dangerous or Hazardous Chemical Materials.
AR 75-14	Responsibilities for Explosive Ordnance Disposal.
AR 75-15	Responsibilities and Procedures for Explosive Ordnance Disposal.
AR 310-25	Dictionary of United States Army Terms.
AR 310-50	Authorized Abbreviations and Brevity Codes.
AR 360-5	Information, General Policies.
(C) AR 360-41	Release of Information on Chemical and Biological Weapons and Defense (U).
(FOUO) AR 380-86	Classification of Chemical Warfare and Biological Research Data.
AR 385-32	Protective Clothing and Equipment.
AR 385-40	Accident Reporting and Records.
AR 740-32	Responsibilities for Technical Escorts of Chemical, Biological, and Etiological Agents.
FM 3-8	Chemical Reference Handbook.
FM 3-15	Nuclear Ordnance Disposal Service.
FM 9-14	Explosive Ordnance Disposal Service.
FM 9-15	Explosive Ordnance Disposal Unit Operations.
FM 21-11	First Aid for Soldiers.
FM 21-40	Chemical, Biological, Radiological, and Nuclear Defense.
FM 21-41	Soldier's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare.
FM 21-48	Chemical, Biological, and Radiological (CBR), and Nuclear Defense Training Exercises.
FM 24-18	Field Radio Techniques.
TM 3-215	Military Chemistry and Chemical Agents.
TM 3-216	Technical Aspects of Biological Defense.
TM 3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
TM 3-240	Field Behavior of Chemical, Biological, and Radiological Agents.
TM 3-250	Storage, Shipment, Handling, and Disposal of Chemical Agents and Hazardous Chemicals.
TM 3-4230-200-12	Organizational Maintenance Manual: Decontaminating Apparatus, Power-Driven, Truck-Mounted, M3A3.
TM 3-4230-203-12	Operator's and Organizational Maintenance Manual: Decontaminating Apparatus, Power-Driven, Truck-Mounted, 400-Gallon, M9.

TM 3-4230-209-12	Operator's and Organizational Maintenance Manual: Decontaminating Apparatus, Power-Driven, Skid-Mounted, Multipurpose, Non-integral, 500-Gallon, ABC-M12A1.
TM 3-6665-254-12	Operator's and Organizational Maintenance Manual: Detector Kit, Chemical Agent, ABC-M18A2.
TM 3-6665-268-10	Operator's Manual: Sampling Kit, CBR Agent, M34.
TM 5-315	Firefighting and Rescue Procedures in Theaters of Operations.
TM 8-285	Treatment of Chemical Agent Casualties.
TM 9-1300-206	Care, Handling, Preservation, and Destruction of Ammunition.
TM 10-277	Protective Clothing—Chemical Operations
TM 750-5-15	Army Equipment Data Sheets: Chemical Weapons and Defense Equipment.
ASubjScd 3-2	Nuclear, Biological, and Chemical (NBC) Decontamination.
ASubjScd 3-54B20	MOS Technical Training and Refresher Training of Decontamination Specialist—MOS 54B20.
CTA 50-901	Clothing and Equipment (Peace).
CTA 50-914	Individual Safety and Protective Clothing and Equipment.
USACMLCS PAM 3	Hazardous Commercial Chemical Data.

2. Commercial Publications

Fire Protection Guide on Hazardous Materials, 3d Edition.

National Fire Protection Association International, 60 Batterymarch St., Boston, MA 02110
Dangerous Properties of Industrial Materials, 3d Edition.

Author: N. Irving Sax; Van Nostrand Reinhold Company, New York

Laboratory Waste Disposal Manual, Manufacturing Chemists Association, 1825 Connecticut Ave., N.W. Washington, DC 20009

Chemical Toxicology of Commercial Products, 3d Edition.

Authors: Gleason, Gosselin, Hodge, and Smith
The Williams and Wilkins Co.
Baltimore, MD.

APPENDIX B

INITIAL HAZARD AREA

1. General

This appendix outlines the procedures for the CBR team leader in establishing the initial hazard area.

2. Establish the Hazard Area

a. Exclusion Area. The initial exclusion area is that area inside a 450-meter radius circle around the accident/incident site. This area, graphically illustrated in figure 10, should be marked on an overlay and maintained on the situation map at the command post. Criteria for adjustment of the initial exclusion area is based on the explosive hazard of the munitions in question.

b. Downwind Distance. The initial downwind distance extends 2,000 meters downwind from the accident/incident site. The downwind hazard area is established by extending two radial lines at an angle of 20 degrees on either side of the primary

wind direction (total angle of downwind hazard area is 40 degrees). Two buffer zones, extending from the edge of the initial exclusion area, are then drawn to intersect the right and left radial lines as shown in figure 10. All unprotected personnel should be evacuated from this area. If available and time permits, the personnel performing the evacuation operations should wear protective masks.

3. Rescue Operations

Immediately, initiate rescue operations for injured personnel determined to be in the hazard area.

4. Command Post

Establish an initial command post in an uncontaminated area at least 50 meters upwind and outside of the exclusion area.

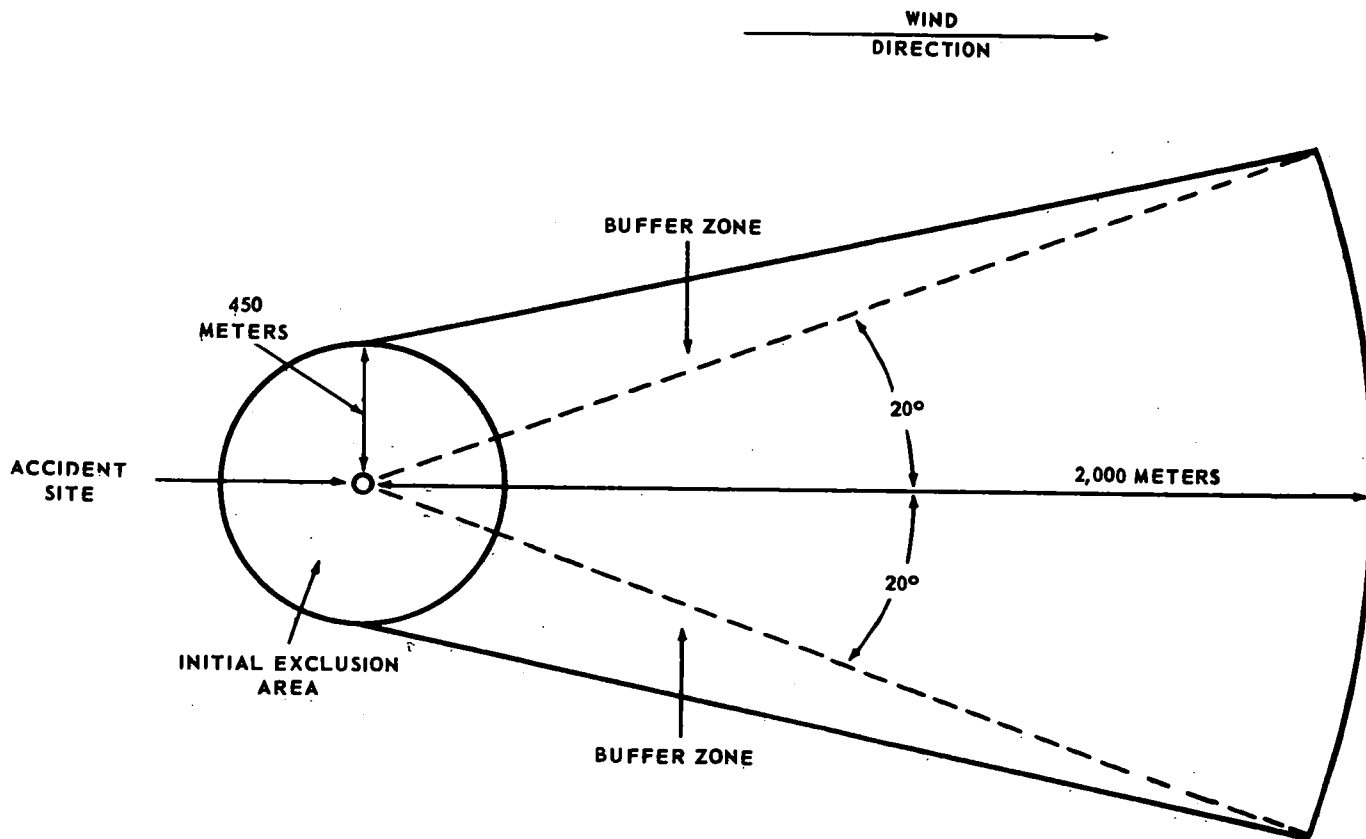


Figure 10. Initial hazard area.

APPENDIX C

PERSONNEL DECONTAMINATION STATION

1. General

A typical PDS is shown in figures 6 and 11. The actual arrangement of the individual stations will depend on the type and amount of agent involved. Four general principles should be followed when establishing the PDS:

- a. Move into the wind as undressing progresses.
- b. Decontaminate and remove the most heavily contaminated items first.
- c. Follow the undressing sequence shown in figure 6 as closely as possible. All articles of clothing worn at the accident/incident site will be removed and decontaminated.
- d. Remove the protective mask as the last item just before showering.

2. Equipment

The recommended items for the setup and operation of the PDS are as follows:

- a. Can, utility, 32-gallon, 8 each.
- b. Bag, plastic, polyethylene, 12 each.
- c. Can, galvanized or plastic, 10-gallon, 4 each.
- d. Brush, chassis, and running gear, 4 each.
- e. Decontaminants. Specific type is determined by agent involved; general types are DS2 and STB.
- f. Pail, metal, 3½-gallon, 2 each.
- g. Soap, powder, 10 pounds.
- h. Water, 50 to 100 gallons.
- i. Immersion heater, 1 each (If available).
- j. Aid station items. Atropine injector, 100 each; M13 decontaminating and reimpregnating kit, 50 each. (Medical support should furnish these items.)

3. Layout of the PDS

(See figures 6 and 11.)

The separation distance between points is 1 to 2

meters *except* between points I and J where it is 30 meters upwind.

a. *Point A—Equipment Drop.* This point will be designated on the hot line for deposit of contaminated equipment returned from the accident/incident site. If a cooling suit is worn, it is removed and deposited at this point. A sheet of plastic, a poncho, or an apron spread on the ground will reduce surface contamination problems. Equipment left at this point will be decontaminated by the undressing assistants after all personnel have been processed through the PDS.

b. *Point B—Outer Garment Decontamination.* The impermeable suit, to include the hood, apron, and boot covers, will be flushed with water or a dilute solution of an appropriate decontaminant to remove the majority of contamination. The contaminated runoff water should be collected in a sump. A large can is needed to hold the decontaminant, and a brush is required for boot cover decontamination.

c. *Point C—Boot Cover Removal.* Boot covers are removed and placed in a can or plastic bag. As the first boot cover is removed, the uncovered boot is placed across the line, and then the second boot cover is removed. The procedure will reduce the spread of contamination throughout the undressing line.

d. *Point D—Boot and Glove Wash.* Boots and outer gloves are washed with appropriate decontaminant. Caustic soda solution is not recommended due to the possibility of skin contact. Washing soda (sodium carbonate) solutions, calcium hypochlorite solutions, STB slurry, and hot soapy water are suitable, depending on the agent involved. A small can (10-gallon) should be used to allow submersion of each boot.

e. *Point E—Boot and Glove Rinse.* A small can of clear water will serve as a second stage wash and will remove decontaminants.

f. *Point F—Outer Gloves and Hood Removal.* A small can or plastic bag is used for deposit of the toxicological agent protective (TAP) gloves and

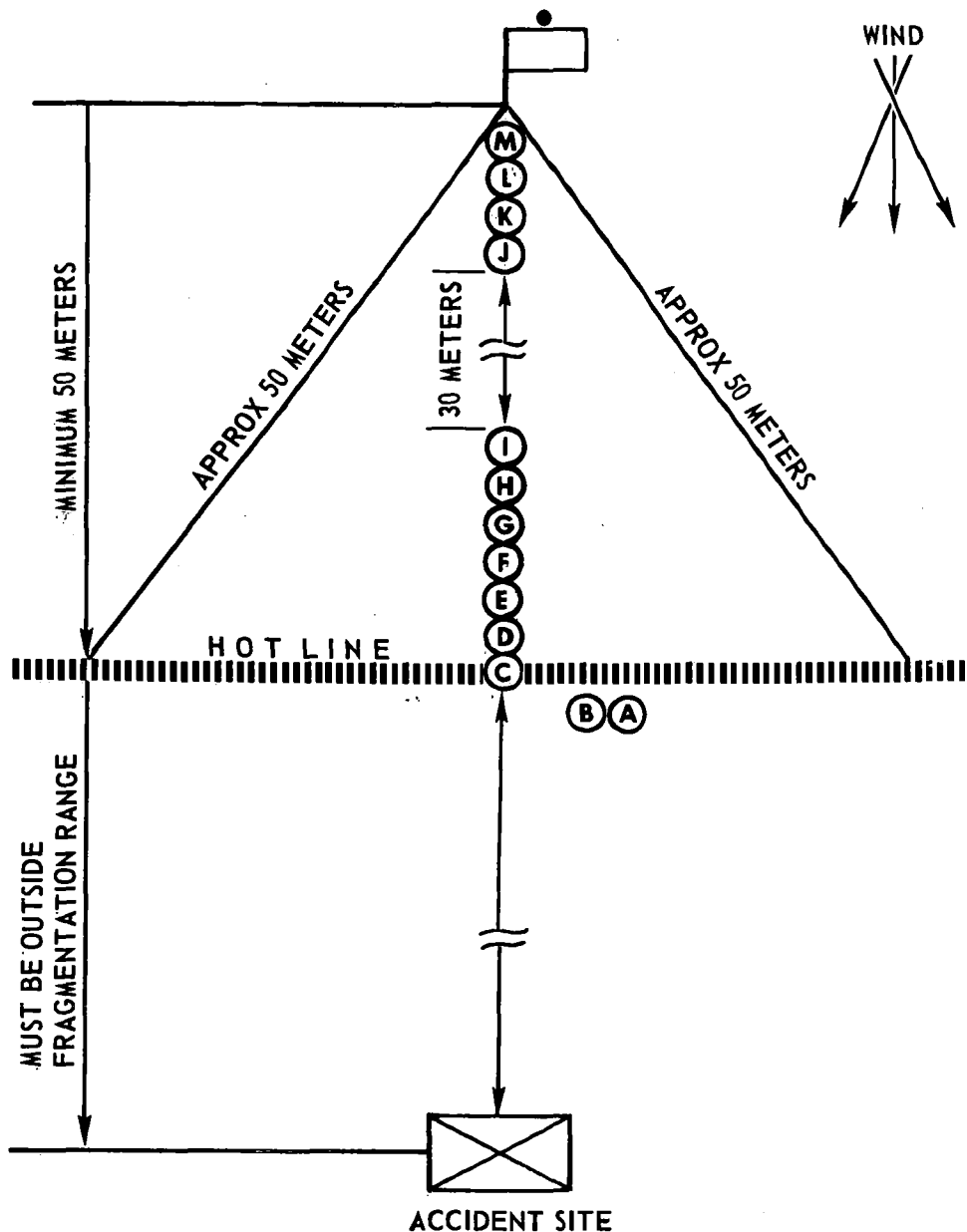


Figure 11. Typical arrangement of PDS at a CB accident site.

the hood of the M3 TAP suit. When removing the hood, the assistant must be careful to prevent breaking the face seal of the M9A1 mask. The wearer should take a deep breath and hold it while the assistant is removing the hood; then he should clear the facepiece. The M6A2 hood will not be removed from the M17 series mask.

g. Point G—Mask Wash. The exterior of the M9A1 protective mask is washed with hot soapy water, taking care not to allow water to enter the canister. If the M17 series mask is being worn, the entire surface of the M6A2 hood will be swabbed along with the eye-lens and inlet valve covers of the mask. A small can of soapy water and a sponge or rag will be used.

h. Point H—Mask Rinse. A small can of clear water and sponge or rag will be used to rewipe the mask. If the M17 series mask is being worn follow the same procedure used at Point G.

i. Point I—Boots and Outer Impermeable Garments. Generally, the rubber boots and M3 TAP coveralls will be removed as a unit. If the TAP apron is worn it will be removed. All rubber items will be placed in a large can or a plastic bag.

Note. Separate point I from point J by 30 meters upwind.

j. Point J—Cloth Coveralls or Field Clothing. If coveralls or environmental field clothing items are

worn, these items will be removed and placed in large cans or plastic bags.

k. Point K—Inner Gloves, Socks, Underwear or Liner. Remove and place in a large can or plastic bag. Undershirt should be removed last. If the undershirt cannot be removed while wearing the mask, hold the breath, remove mask (and hood, if M17 series mask is worn), and remove undershirt; replace, clear, and check the mask, then move quickly to shower or wash point.

Note. Replacing and clearing the protective mask

may be eliminated if the shower point is close enough to make this action unnecessary.

l. Point L—Mask Removal and Showering. Take a deep breath and hold it, remove mask, rinse head and upper body, and resume breathing. Using a small bucket, pour water over body and lather with soap. Rinse with another bucket of water from large can.

m. Point M—Redressing and Aid Station. This station will contain clean clothing for redressing and first-aid items.

By Order of the Secretary of the Army:

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